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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No.: 09/820,114 Confirmation Number: 2326
Applicant: Ching-Wei Chang
Filed: March 28, 2001
Group #: 2625
Examiner: James A. Thomson

Docket No: SLA.0390
Customer No: 55376
For: Method for Screening of Halftone Images

MS Appeal
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

APPEAL BRIEF UNDER 37 C.F.R. §41.37

In support of the appeal to the final rejection of the claims in the above-referenced application, dated June 14, 2006, and the Notice of Appeal, filed September 7, 2006, Appellants respectfully submit the following Appeal Brief.

1. Statement of the Real Party in Interest under 37 C.F.R. §41.37 (c)(1)(i)

The real party in interest is Sharp Laboratories of America, Inc., having a place of business at Camas, Washington. Applicant Ching-Wei Chang has assigned 100% of his interest in this Application to the real party in interest.

2. Status of Related Appeals and Interferences under 37 C.F.R. §41.37(c)(1)(ii).

There are no related Appeals or Interferences.

3. Status of all Claims under 37 C.F.R. §41.37(c)(1)(iii).

Claims 1-17 are pending. All claims stand rejected. All claims pending in the

Application are hereby Appealed.

There are three independent claims: claims: 1, 8 and 13.

4. Status of Amendments under 37 C.F.R. §41.37(c)(1)(iv)

No amendments after final rejection have been filed.

5. Summary of the Claimed Subject Matter under 37 C.F.R. §41.37(c)(1)(v)

The invention provides a method of screening, in color reproduction systems, to render second generation halftone images through a multi-level halftone technique. *It should be understood that the method of the invention is not a de-screening process:* the method of the invention preserves the original halftone dots and pixels therein, which is why the method of the invention is able, efficiently, to generate a second generation halftone image without the generation of interference lines, or moiré.

Under known, prior art methods, it is difficult to render halftone images using a second halftone process, because two halftones interfere, causing a distortion, in the form of a low frequency binary banding pattern, called moiré, which appears as alternating light and dark bands, or patches, in the second generation halftone image.

The normal procedure to reduce or eliminate this moiré is by applying a low pass filter to the original halftone image, thus smoothing or eliminating the binary pattern. The application of such low pass filters smooths or eliminates the original halftone pattern, which is essentially an averaging process over the entire halftone pattern. The filtering process causes blurred edges and loss of fine details. This additional process considerably slows the rendering process. Some improvements to the filtering process attempt to preserve sharp edges, however, these improvements only help to preserve hard, distinct edges and do nothing to preserve fine details.

The method of the invention uses a multi-level screening process to preserve the original halftone structure, without introducing distortion, or moiré, into a resultant, second generation halftone image. The method of the invention does not destroy or blur the halftone pattern: it preserves the original halftone dots by using multi-level tone reproduction. This method renders the original halftone image without introducing any interference pattern, or moiré, from the second screen pattern, which normally interferes with the original screen pattern.

In the method of the invention, multi-level halftoning provides a "soft screening", that *averages the scanning noises* without reconstructing new halftone centers and without averaging the image components, as it does in a low-pass filter, or de-screening, process. The steps of the method of the invention are as follows:

1. **Determine the number of tone levels required in a pixel.** A continuous tone image pixel requires 256 graylevels to provide an accurate representation, however, a halftone image pixel does not require the full 256 graylevels. If, however, there are not enough graylevels, the original halftone dots will not be accurately reproduced.

2. **Select a halftone cell size.** For example, for 4-bit halftoning, each pixel may display 15 levels of gray; therefore, an NxN sized halftone cell is able to display K amount of graylevels, where K = N x N x 15. For good printing quality, a halftone dot should be able to display 255 graylevels, at least be able to display a number of graylevels close to 255. The original dot density is preserved by applying a multi-step threshold during scanning.

3. **Arrange the dot growth pattern.** If the dot growth pattern begins in the center of the halftone cell, a screen pattern will be visible. If any periodic dot centers can be visually sensed, the screen pattern will also be visible. The method of the invention provides a technique for avoiding

the dot centers by growing the halftone dots evenly over the entire halftone cell. "Evenly" means that, in a tint area for any input graylevel, the maximum sub-pixel level difference among all pixels is "1".

The method of the invention uses a very fine grid, which is a repeatable pattern, which follows the original halftone structure. The input signal is used with several levels of thresholding, *i.e.*, the halftoned image is processed using multilevel thresholding, however, because no secondary pattern is applied to the original signal, no moiré is produced.

There is a significant difference between a multi-level halftone, as used in the output in the method of the invention, and a bitonal halftone, as described in the applied art. A bitonal halftone is a halftone resulting from a print engine which lays down a fixed amount of ink/toner for each pixel; a multi-level halftone results from a print engine which is able to vary the amount of ink/toner laid down for each pixel.

A conventional rendering process: follows the steps:

continuous tone image → two-tone processes → two-tone (bitonal) halftone image

such as the method of applied reference Hanyu.

The method of the invention follows the steps:

any halftone image → scan → continuous tone image → special multi-level processes → multi-level halftone image.

Other prior art second generation halftone process:

two-tone (bitonal) halftone image → scan → continuous tone image → descreening → continuous tone image → bitonal or multi-level halftone processes → bitonal or multi-level halftone image.

Descreening is a difficult, slow process.

Rendering halftone image without the method of the invention or without descreening:

two-tone (bitonal) halftone image → scan → continuous tone image → bitonal or multi-level halftone processes → bitonal or multi-level halftone image

with moirè, results in bad patterning

The Independent Claims

As there is no guidance provided by the U. S. Patent and Trademark Office as to *how* the independent claims are to be linked to the drawings and specification, **Applicant has adopted the following format, which includes recitation of the independent claims, annotated with reference numbers, figure numbers and specification page and line numbers, wherein a representation, *e.g.*, (10 Fig. 1 6/1-3) directs the reader to reference number 10 of Fig. 1, and to specification page 6, lines 1 to 3.**

Claim 1. A method of making second generation halftone images lacking visible interference (Figs. 7-13, 7/2-9), comprising:

selecting an image which has been halftoned by forming original halftone dots, wherein each halftone dot includes at least one pixel therefor (9/1-9);

determining a number of tone levels required for each pixel of the selected halftoned image (Figs. 3 & 4, 9/1-9);

arranging the number of tone levels in a set of tone levels (9/10-13);

identifying a high-frequency halftone cell size (9/10-13);

scanning the selected halftoned image to produce a second generation multi-level halftoned image, which retains the original halftone dots and pixels therein (8/11-19);

reproducing, for each pixel in the second generation multi-level halftoned image, a pixel tone level (Figs. 9-13, 11/1-18, Table 1);

selecting, from the set of tone levels, a tone level closest to the pixel tone level of each pixel in the second generation multi-level halftoned image to minimize noise generated during scanning without constructing a new halftone center (9/14-11/27);

arranging a dot growth pattern evenly across the second generation multi-level halftoned image (9/16-17).

Claim 8. A method of making second generation multi-level halftone images lacking visible interference (Figs. 7-13, 7/2-9), comprising:

selecting an image which has been halftoned by forming original halftone dots, wherein each halftone dot includes at least one pixel therefor (9/1-9);

determining a number of tone levels required for each pixel of the selected halftoned image (Figs. 3 & 4, 9/1-9);

arranging the number of tone levels in a set of tone levels (9/10-13);

identifying a high-frequency halftone cell size (9/10-13);

scanning the selected halftoned image to produce a second generation multi-level halftoned image, which retains the original halftone dots and pixels therein (8/11-19);

reproducing, for each pixel in the second generation multi-level halftoned image, a pixel tone level (Figs 9-13, 11/1-18, Table 1);

selecting, from the set of tone levels, a tone level closest to the pixel tone level of each pixel in the second generation multi-level halftoned image to minimize noise generated during scanning without constructing a new halftone center (9/14-11/27);

arranging a dot growth pattern to offset initial dot growth from the center of the halftone cell by defining sub-cells and growing the dot pattern relative to the sub-cell (9/16-17);

determining a sub-pixel level difference (9/14-21); and

growing a dot pattern evenly across the second generation multi-level halftoned image by setting the sub-pixel level difference to one while preserving halftone dot original amplitude (9/16-21).

Claim 13. A method of making second generation multi-level halftone images lacking visible interference (Figs. 7-13, 7/2-9), comprising:

selecting an image which has been halftoned by forming original halftone dots, wherein each halftone dot includes at least one pixel therefor (9/1-9);

determining a number of tone levels required for each pixel of the selected halftoned image (Figs. 3 & 4, 9/1-9);

arranging the number of tone levels in a set of tone levels (9/10-13);

identifying a high-frequency halftone cell size (9/10-13);

scanning the selected halftoned image to produce a second generation multi-level halftoned image, which retains the original halftone dots and pixels therein (8/11-19);

reproducing, for each pixel in the second generation multi-level halftoned image, a pixel tone level by setting multi-level thresholds (Figs. 9-13, 11/1-18, Table 1);

selecting, from the set of tone levels, a tone level closest to the pixel tone level of each pixel in the second generation multi-level halftoned image to minimize noise generated during scanning without constructing a new halftone center (9/14 - 11/27);

arranging a dot growth pattern to offset initial dot growth from the center of the

halftone cell by defining sub-cells and growing the dot pattern relative to the sub-cell (Fig. 8, 9/16-17, 10/8-15);

determining a sub-pixel level difference (9/14-21); and

growing a dot pattern evenly across the second generation multi-level halftoned image by setting the sub-pixel level difference to one while preserving original dot amplitude (9/16-21).

6. Grounds of Rejection to be Reviewed on Appeal under 37 C.F.R. §41.37(c)(1)(vi)

Ground A: Claim 1 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over U. S. Patent No. 5,812,742 to Hanyu, granted September 22, 1998, in view of U. S. Patent No. 6,072,590 to Sano *et al.*, granted June 6, 2000.

Ground B: Claims 2-17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over '742 in view of U. S. Patent No. 5,812,742 to Hanyu, granted September 22, 1998, in view of U. S. Patent No. 6,072,590 to Sano *et al.*, granted June 6, 2000. and further in view of U. S. Patent No. 5,777,757 to Karlsson *et al.*

7. Arguments under 37 C.F.R. § 41.37 (c)(1)(vii)

Ground A: Claim 1 requires "...selecting an image which has been halftoned...." The portion of '742 cited for this element clearly recites that a two-tone image is the input, and is thus "selected." The claim further requires that "...each halftone dot includes at least one pixel therefor;..." The applied portion of '742 describes shading in the dots representing pixels in the drawing figures of the patent in a two-tone image as being "halftoned." Thus, there is no teaching or suggestion in the applied portion of the reference that each halftone dot includes at least one pixel therefor. So, if anything, '742 teaches that one may represent pixels with halftoned dots, however, this does noting to teach or suggest the required element of Applicant's claim. Continuing, the next element of claim 1

requires "...determining a number of tone levels required for each pixel of the selected halftoned image;..." The applied portion of '742 is 9/36-41 and 9/51-57, however, if the text spanning 9/35-67 is carefully read, it will be clear to the Examiner that the discussion presented by '742 is describing a technique of taking an average of bitonal pixels spanning a 12x12 array of pixels, thus, the requisite "tone levels" do not exist, as that term would be understood by one of ordinary skill in the art, because the discussion deals solely with bitonal pixels, *i.e.*, not continuous tones as are present when dealing with the halftone images which are the subject of the method of the invention of the instant Application.

The next element of claim 1 is "...arranging the number of tone levels in a set of tone levels;..." The portion of '742 applied as teaching this limitation, in reality, describes the organization of a group of magnified dots, which are not tone levels, and are not in a set of tone levels. Again, we are dealing with a bitonal halftone image. The high-frequency halftone cell size is allegedly the result of organizing dots for a *second* halftone operation into 1x1, 2x2, *etc.* cells, however, the necessary element of a second generation multi-level halftoned image is missing.

The most significant flaw in the Examiner's argument comes with the alleged teaching of the next element of claim 1: "...scanning the selected halftoned image to produce a second generation multi-level halftoned image, which retains the original halftone dots and pixels therein;..." There is no halftoned image in '742 to scan, *i.e.*, the scanned image in '742 is a document to faxed; there is no resultant second generation multi-level halftoned image, and, even if the first two elements were present, '742 magnifies and manipulates the pixels to smooth jaggies, thus *NOT* retaining the original multi-level halftone dots and pixels therein. 9/17-10/7. The portion of '742 applied by the Examiner merely recites the arrangement of bitonal dots in a 12x12 array. The same argument

applied to the next element of claim 1, namely, "...reproducing, for each pixel in the second generation multi-level halftoned image, a pixel tone level;..." Although the Examiner contends that scanning by a fax machine produces a first generation halftone and the reception by a second fax machine generates a second generation halftoned image, the Examiner's interpretation is not supported by the applied reference, which conducts all of the operations described in '742 in the receiving unit - and merely smooths jaggies before providing the output hardcopy. Applicant is not aware of any facsimile machine which uses a multi-level halftone screen in any phase of it normal operation, which is the manner in which a multi-level halftoned image is generated. Applicant requires that pixel tone levels for each pixel be selected from a set of tone levels, *etc*. The applied portion of '742 describes averaging over pixel sets, which does not teach or suggest the claim limitation.

Whether or not '590 teaches or suggests the remaining element is irrelevant, *i.e.* not material, to the examination of Applicant's claims, as '590 uses the context of a supercell with variable angle halftone screens, which are simply not present in Applicant's method of the invention, and which, if removed from '590, render that invention inoperable. It is not understood how the variable angle halftone screen of '590 could or would or ought to be incorporated with the facsimile machine of '742, so there does not seem to be any support for the Examiner concocted combination.

The Examiner's contention that Hanyu ('742) is analogous art is not well taken: '742 deals with imaging, however, it does not deal with multi-level halftone imaging, and does not convert a first generation halftone image into a second generation multi-level image; '742 uses an image or printed page or signal received from another facsimile machine as input, and smooths the jaggies found in the usual facsimile rendering. '742 does nothing to minimize halftone processing artifacts,

because it does not provide a multi-level halftone images as output. It is significant that neither '742 nor '590 have the words "second generation," "interference" or "moirè" anywhere in the specification claims or drawings. The use of these terms is to be expected when dealing with production of a second generation multi-level halftoned image with reduced interference and moirè. The lack of these terms in the applied references is because neither of these references are related to reducing interference in a second generation multi-level halftone image. Claim 1, having no elements thereof taught or suggested by the applied art, is clearly allowable over that art.

The Examiner, in the Final Office action, merely repeated the formal rejection from the previous Office action, and provided five-and-one-half pages of responses to Applicant's previous arguments. Applicant now addresses some of those Examiner responses:

(Regarding page 7, lines 2-11) Applicant did not object to the application of Hanyu and Sano *et al.*; Applicant questioned why these two references were not earlier applied. The Examiner could have applied these references in the first Office action, but failed to do so. The claims as they now stand in the Application are substantially similar to those originally presented in 2001. The Examiner seems to be conducting a piecemeal examination of this Application.

(Regarding page 9, lines 3-18) The Examiner continues to interpret "bi-tonal" and "multi-tonal" inconsistently with the interpretation which would be applied by one of ordinary skill in the art, and hence, twists the language of the Claims and References to produce what appears to be similar teachings and results, but which would not be understood by one of ordinary skill in the art to be similar at all.

(Regarding page 9, line 19 to page 10, line 4) Applicant is well aware of what constitutes obviousness; Applicant merely points out that, given the teachings of Hanyu and Sano *et*

al., one of ordinary skill in the art would not be inclined to combine the teachings, thus it is not obvious to combine the references as the Examiner has done because one of ordinary skill in the art would have radically to modify the teachings of the references to produce the results posited by the Examiner.

(Regarding page 10, lines 5-6) Applicant is quite clear that the purpose and function of the invention is to reduce interference, known as moirè. If, as contended by the Examiner, all three references were, in fact, related to such a process, it makes logical sense that all three references would use standard industry terms, such as interference and moirè, however, only '757 contains these words. The presentation of this argument by Applicant is to point out that the other two references are not really analogous art.

(Regarding page 10, line 7 to page 11, line 11) Again, the Examiner is trying to make a two-tone image into a multi-level half-tone image - which is not correct, and would not be considered correct by one of ordinary skill in the art. The Examiner completely ignores the plain language of Applicant's claim 1 in the remainder of the argument.

(Regarding page 11, line 12 to page 12, line 8) The Examiner is correct that jaggy smoothing and magnification are not part of the scanning of the first image (which, contrary to the Examiner's contention, is NOT a halftone image - it is a continuous tone image in a fax machine), but it is part of the output, which does not retain the original halftone dots and pixels. How can it retain the original halftone dots and pixels when it has smoothed the second generation image to smooth jaggies? It cannot.

(Regarding page 12, lines 9-15) Applicant is not asking that teaching of Sano *et al.* be "ripped out." However, the Examiner may not use a portion of a reference to show obviousness if

the use of that portion of the reference in the manner suggested by the Examiner renders the invention of the teaching inoperable. Again, one of ordinary skill in the art would not be inclined to incorporate the teaching of Sano *et al.* in the manner suggested by the Examiner because of the radical modification required to the teachings of Sano *et al.* to produce the combination of elements recited in Applicant's claim 1.

Ground B:

Claims 2-5 stand or fall with allowable parent claim 1.

Claim 6 recites that number of tone levels is fifteen plus white. The reasons for this is found in the Specification, 9/21 to 10/2, because this is the maximum number of tone levels perceptible by the HVS. The applied portion of '742 (col. 9, lines 51-53 and col. 10, lines 1-7) is the oft used "averaging" technique, which initially determines a maximum tone level (singular) "P," which is a function of the average of the 12x12 array. So, until one knows the value of P, it doesn't matter what size pixel array is used, it will not inherently result in Applicant's 15 levels of gray plus white; it will result in a multi-tone level of indeterminate value, unless the unlikely average of the 12x12 array is "1." None of this has anything to do with selecting the maximum number of tone levels to be fifteen levels of gray plus white based on the HVS: if $P \neq 1$, some other number of tone levels will be used. Claim 6 is therefor allowable over the applied art, because the applied art does not teach or suggest specifically setting the number of tone levels to fifteen levels of gray plus white.

Claim 7 stand or falls with its allowable parent claim 1.

Claim 8 is allowable for the reasons set forth in connection with claim 1, and because claim 8 includes an additional limitation of preserving original halftone dot amplitude, as described in the Specification, 8/2-10. As noted in the previously provided discussion of the invention, and in the

discussion of the applied art, where a halftoned image is descreened, the original dot density, treated as a signal amplitude, is not preserved. Applicant's method of the invention, using multi-step threshold reading of the original halftoned image allows the original halftone dot amplitude to be preserved. This is neither taught nor suggest by either applied reference, nor by a combination thereof, in spite of the Examiner's contention. The Examiner acknowledges that '742 does not teach nor suggest this limitation. The portions of '590 do not teach nor suggest the limitations of claim 8 not found in claim 1. '757, contrary to the Examiner's assertion that original dot amplitude is preserved, as required by claim 8, teaches that the intensity of a halftone cell increases, which must certainly require a change in amplitude of the pixels therein, '757, 6/5-16, thus changing original dot amplitude. Claim 8 is allowable over the prior art of record.

Claim 9 is allowable for the reasons set forth in connection with claim 6.

Claims 10-12 stand or fall with their allowable parent claim.

Claim 13 includes the limitations of claim 8 and an additional limitation which requires the setting of a multi-level threshold. This feature of the invention is described in the Specification, beginning on page 7, and is shown in Figs 1-4. There is no teaching nor suggestion of applying threshold values to an existing multi-level halftone image to generate a second generation multi-level halftone image. The Examiner applies the now infamous '742, 9/60-67, aka, "the averaging algorithm." Once again, the value of P is determined from the 12x12 bitonal array, and multiple-tone levels determined for the resultant bitonal dot group. Thus, a multiple-tone level is set, but there is no tone level (singular) set for each pixel in the second generation multi-level halftone, as required by the claim language, for all the usual reasons, *e.g.*, lack of a second generation multi-level halftone images and magnification of the pixels of the image in '742 *vice* retaining the pixels of the first generation

halftone image. Claim 13 is therefore allowable over the cited art.

Claims 14-17 stand or fall with their allowable parent claim.

Having shown that the applied art does not teach nor suggest the appellant's invention as claimed, Appellants request that the Examiner's final rejection of these claims be reversed.

Customer Number	Respectfully Submitted,
55376	ROBERT D. VARITZ, P.C.

Robert D. Varitz

Robert D. Varitz
4915 S.E. 33d Place
Portland, Oregon 97202

Registration No: 31436
Telephone: 503-720-1983
Facsimile: 503-233-7730

RDV:bd

8. CLAIMS APPENDIX TO APPELLANT'S BRIEF under 37 C.F.R. § 41.37 (c)(1)(viii)

The claims on appeal in the above-referenced application are reproduced hereinbelow as follows:
****

Claim 1. A method of making second generation halftone images lacking visible interference, comprising:

selecting an image which has been halftoned by forming original halftone dots, wherein each halftone dot includes at least one pixel therefor;

determining a number of tone levels required for each pixel of the selected halftoned image;

arranging the number of tone levels in a set of tone levels;

identifying a high-frequency halftone cell size;

scanning the selected halftoned image to produce a second generation multi-level halftoned image, which retains the original halftone dots and pixels therein;

reproducing, for each pixel in the second generation multi-level halftoned image, a pixel tone level;

selecting, from the set of tone levels, a tone level closest to the pixel tone level of each pixel in the second generation multi-level halftoned image to minimize noise generated during scanning without constructing a new halftone center;

arranging a dot growth pattern evenly across the second generation multi-level halftoned image.

Claim 2. The method of claim 1 which further includes determining a sub-pixel level

difference.

Claim 3. The method of claim 2 wherein said growing includes growing the dot pattern evenly across the second generation multi-level image by setting the sub-pixel level difference to one.

Claim 4. The method of claim 2 wherein said defining a sub-cell includes defining a cell to be a 4x4 pixel matrix, and defining a sub-cell to be a 2x2 pixel 2D matrix, having a sub-pixel level difference matrix values for each pixel in the cell and sub-cell.

Claim 5. The method of claim 4 wherein said arranging includes scaling up the matrix values from zero to one, to zero to 255.

Claim 6. The method of claim 1 wherein the number of tone levels is fifteen levels of gray plus white.

Claim 7. The method of claim 1 wherein the cell size is 4x4 pixels.

Claim 8. A method of making second generation multi-level halftone images lacking visible interference, comprising:

selecting an image which has been halftoned by forming original halftone dots, wherein each halftone dot includes at least one pixel therefor;

determining a number of tone levels required for each pixel of the selected halftoned image;

arranging the number of tone levels in a set of tone levels;

identifying a high-frequency halftone cell size;

scanning the selected halftoned image to produce a second generation multi-level halftoned image, which retains the original halftone dots and pixels therein;

reproducing, for each pixel in the second generation multi-level halftoned image, a pixel tone level;

selecting, from the set of tone levels, a tone level closest to the pixel tone level of each pixel in the second generation multi-level halftoned image to minimize noise generated during scanning without constructing a new halftone center;

arranging a dot growth pattern to offset initial dot growth from the center of the halftone cell by defining sub-cells and growing the dot pattern relative to the sub-cell;

determining a sub-pixel level difference; and

growing a dot pattern evenly across the second generation multi-level halftoned image by setting the sub-pixel level difference to one while preserving halftone dot original amplitude.

Claim 9. The method of claim 8 wherein the number of tone levels is fifteen levels of gray plus white.

Claim 10. The method of claim 8 wherein the cell size is 4x4 pixels.

Claim 11. The method of claim 8 wherein said defining a sub-cell includes defining a cell to be a 4x4 pixel matrix, and defining a sub-cell to be a 2x2 pixel 2D matrix, having a sub-pixel level difference matrix values for each pixel in the cell and sub-cell.

Claim 12. The method of claim 11 wherein said arranging includes scaling up the matrix values from zero to one, to zero to 255.

Claim 13. A method of making second generation multi-level halftone images lacking visible interference, comprising:

selecting an image which has been halftoned by forming original halftone dots, wherein each halftone dot includes at least one pixel therefor;

determining a number of tone levels required for each pixel of the selected halftoned image;

arranging the number of tone levels in a set of tone levels;

identifying a high-frequency halftone cell size;

scanning the selected halftoned image to produce a second generation multi-level halftoned image, which retains the original halftone dots and pixels therein;

reproducing, for each pixel in the second generation multi-level halftoned image, a pixel tone level by setting multi-level thresholds;

selecting, from the set of tone levels, a tone level closest to the pixel tone level of each pixel in the second generation multi-level halftoned image to minimize noise generated during

scanning without constructing a new halftone center;

arranging a dot growth pattern to offset initial dot growth from the center of the halftone cell by defining sub-cells and growing the dot pattern relative to the sub-cell;

determining a sub-pixel level difference; and

growing a dot pattern evenly across the second generation multi-level halftoned image by setting the sub-pixel level difference to one while preserving original dot amplitude.

Claim 14. The method of claim 13 wherein the number of tone levels is fifteen levels of gray plus white.

Claim 15. The method of claim 13 wherein the cell size is 4x4 pixels.

Claim 16. The method of claim 13 wherein said defining a sub-cell includes defining a cell to be a 4x4 pixel matrix, and defining a sub-cell to be a 2x2 pixel 2D matrix, having a sub-pixel level difference matrix values for each pixel in the cell and sub-cell.

Claim 17. The method of claim 16 wherein said arranging includes scaling up the matrix values from zero to one, to zero to 255.

9. EVIDENCE APPENDIX TO APPELLANT'S BRIEF under 37 C.F.R. § 41.37 (c)(1)(ix)

NONE

10. RELATED PROCEEDINGS APPENDIX TO APPELLANT'S BRIEF under 37 C.F.R. § 41.37 (c)(1)(x)

NONE

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Alexandria, Virginia 22313-1450

Robert D. Varitz